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(11) EP 0 952 637 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.10.1999 Bulletin 1999/43

(51) Int. Cl.⁶: H01R 13/658

(21) Application number: 99200507.4

(22) Date of filing: 23.02.1999

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

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(30) Priority: 24.04.1998 US 65934

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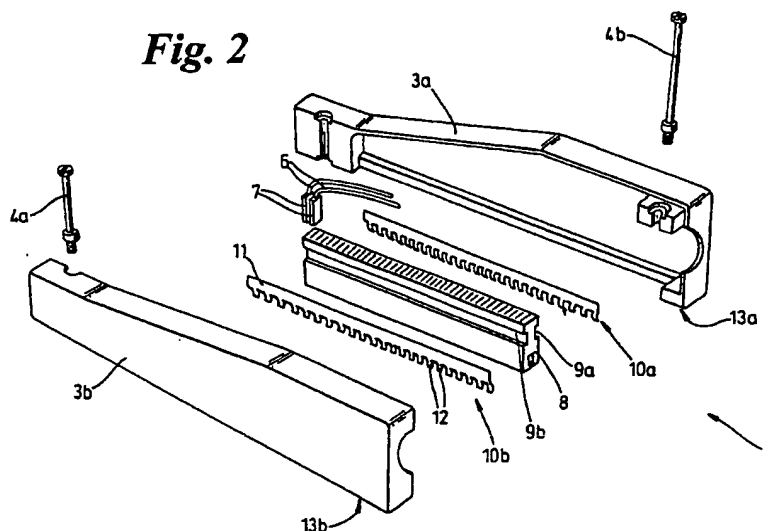
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(54) Multiple coaxial cable connector

(57) Connectors for connecting multiple coaxial cables are typically complex with many parts and difficult to assemble. The present invention provides an improved multiple coaxial cable connector and a method of using the same. The preferred connector comprises a socket connector (8) adapted to receive a plurality of coaxial cables each terminated in a termination socket (7) and to expose at least a part of each socket when fitted, a connection element (10a,10b), and a casing component (3a,3b) adapted to receive the coaxial cables and including at least partial metallisa-

tion to a face plate (13a,13b). The connection element (10a,10b) bonds each termination socket (7) to the casing component face plate (13a,13b) and when connected, to a receiving element for the cable connector. Preferably the socket connector (8) is an SCI connector and the termination sockets (7) are SCI sockets. The connection element (10a,10b) preferably includes spring fingers (12) corresponding to each termination socket (7).

Fig. 2



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Description

FIELD OF THE INVENTION

[0001] The present invention relates to improvements 5
in or relating to multiple coaxial cable connectors.

PRIOR ART

[0002] Typically when coaxial cables are connected to 10
an item of electrical equipment, the signal path from the
coaxial connector to the circuit board (PCB) of the
equipment is not coaxial. This non-coaxial manner of
termination results in a radiated emissions phenomena
known as pigtailed radiation in which the non-coaxial 15
parts of the signal path actually radiate part of the signal.
The intentional circuit current flowing through this
connection produces a volt drop that acts as an excitation
voltage between the equipment PCB/frame ground and the
coaxial cable braid. This produces an end driven dipole mode
of electromagnetic radiation. Additionally, the penetration of
the coaxial cable screen into the equipment enclosure allows
spurious signal coupling to the screen which also causes the
cable screen to radiate unintentional electromagnetic radiation
(probe effect).

[0003] Where large numbers of coaxial cables are 20
required, for example in telecommunications multiplexers,
individual coaxial connector terminations are impractical
and D-type or SCI style connectors would typically be used
to enable cost effective mass termination of the coaxial
cables. While the effect of pigtailed coaxial radiation or
probe effect EMR on one cable may be small and well below
Class B emission limits (Euro-Norm EMC Standard EN55022),
aggregation from many cables exacerbates this effect and
can produce Class B and even Class A failures or poor margins.

[0004] One prior art attempt at reducing this problem 25
is to ground the outer coaxial braids of the cables to the
PCB/frame ground at their ingress to a connector. In this
arrangement a section of each cable is stripped to expose
the braid which is then bunched together and grounded by
a metal strap (at entry to the connector) and conductive
pathway to the PCB/frame ground. This arrangement however
does not provide positive grounding on each cable, particularly
as the number of cables bunched together increases.

[0005] US4340265 discloses a multi-socket coaxial 30
assembly in which an electrically conducting moulded shell
is employed which includes an integrally moulded connector
plate having apertures into which the outer conductors of
coaxial cables are inserted making electrical contact. The
connector includes a specially cast shell and integrally
formed connector panel with a plurality of apertures adapted
to receive both coaxial and power cables. This connector
arrangement is expensive to produce and time consuming to
assemble and is not suitable for large numbers of coaxial
cables for which

connection is required in a relatively small space.

[0006] US4889500 discloses a multiple coaxial cable
leads plug which includes a honeycomb grounding block to
engage the outer conductor of each coaxial terminal. This
many part connector is both expensive and complex to produce
and to assemble during installation of the cables.

OBJECT OF THE INVENTION

[0007] It is an object of the present invention to provide
an improved cable connector for multiple coaxial cables.

[0008] It is a further object of the present invention to
reduce electromagnetic radiation emanating from multiple
coaxial cable connectors.

SUMMARY OF THE INVENTION

[0009] In a first aspect of the present invention there
is provided a cable connector comprising:

a linear socket connector for terminating a plurality
of coaxial cables in respective sockets;
a casing component for housing said socket connector;
and a connection element;
wherein said connection element is arranged to contact
each coaxial cable to electrically connect each said cable
to an outer surface of the casing component whereby to reduce
electromagnetic radiation emissions.

[0010] In a second aspect of the invention there is provided
a cable connector comprising:

a socket connector for receiving a plurality of coaxial
cable termination sockets;
a connection element;
a casing component adapted to receive a plurality of
coaxial cables;
wherein said socket connector exposes at least a part of
each termination socket when fitted, and wherein said
connection element is arranged to electrically connect each
said exposed part to an outer surface of the casing component.

[0011] Preferably said socket connector is an SCI connector
and said termination sockets are SCI sockets. Preferably
said SCI connector comprises a longitudinal recess or cut-away
which exposes the outer conductors of said SCI sockets when
fitted.

[0012] Preferably said SCI connector comprises two
longitudinal recesses on opposite sides of said SCI connector,
each of which expose the outer conductors of said SCI sockets
when fitted. Preferably said recesses are located at different
sectional heights on said SCI connector.

[0013] Preferably said connection element comprises

a plurality of spring fingers each adapted to contact a termination socket. Preferably the spring fingers are comprised of berrillium copper alloy. Alternatively, the connection element may be an electrically conducting strip for example a conductively loaded elastomer strip. As a further alternative the connection element may be integrally formed within the casing component.

[0014] Preferably, where said SCI connector comprises two longitudinal recesses, said cable connector comprises two connection elements located to connect each said SCI socket from two sides to said casing component.

[0015] Preferably said casing component is comprised of two parts. Preferably said casing components are comprised of metal, alternatively the casing components may be comprised of metallised plastic. As a further alternative, the casing components may comprise a metallised strip secured to a plastic casing, said strip extending from connection with the connection element to the face plate of said casing components. As a still further alternative, the connection element may extend to the face plate.

[0016] Preferably, said cable connector comprises a plurality of coaxial cables each terminated with a termination socket.

[0017] In a further inventive aspect the present invention provides a method of connecting a plurality of coaxial cables using a cable connector comprising:

- a socket connector for receiving a plurality of coaxial cable termination sockets;
- a connection element;
- a casing component adapted to receive a plurality of coaxial cables;
- wherein said socket connector is adapted to expose at least a part of each termination socket when fitted, and wherein said connection element is arranged to electrically connect each said exposed termination socket to an outer surface of the casing component. the method comprising the steps of:
- fitting a plurality of coaxial cables each terminated in a termination socket into said socket connector;
- securing said casing component to said socket connector such that said connecting element bonds each termination socket to said outer surface;
- securing said cable connector to a receiving element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] In order to show how the invention may be carried into effect, embodiments of the invention are now described below by way of example only and with reference to the accompanying figures in which:

Figure 1 shows the connector connected to the face plate of an item of electrical equipment;
Figure 2 shows an exploded perspective view of the

components of a preferred connector; and

Figure 3 shows a section cut-away of the connector with coaxial cables fitted.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Figure 1 shows a preferred connector 2 of the invention connected to the face plate assembly 21 of a printed circuit board 20 forming part of an electronic system, for example a telecommunications multiplexer unit. The connector 2 comprises two casing components 3a and 3b which are adapted to receive a cable loom 5 containing a number of coaxial cables. The connector 2 is in positive electrical contact with the PCB face plate 21 using one or more screws 4a and 4b.

[0020] Referring to Figure 2, the connector 2 further comprises a socket connector 8, and two connecting elements 10a and 10b. The socket connector 8 is adapted to receive coaxial cable termination sockets 7. The socket connector 8 includes two longitudinal recesses 9a and 9b which are adapted to expose part of the outer conducting casing of each termination socket 7. Preferably the longitudinal recesses 9a and 9b are located at different sectional heights of the socket connector 8 to improve the mechanical rigidity of the socket connector 8.

[0021] Preferably the socket connector 8 and the termination sockets 7 are of the SCI type.

[0022] The connecting elements 10a and 10b each comprise a metallic strip 11 from which are formed a plurality of metallic fingers 12 which contact respective termination sockets 7. The connecting elements 10a and 10b are located between the socket connector 8 and the casing components 3a and 3b respectively such that each cable termination socket 7 when fitted into the socket connector 8 is connected via a respective spring finger 12 and metal strip 11 to the casing components 3a and 3b.

[0023] But it would be understood by those skilled in the art that an alternative to exposing the termination sockets would be to expose a portion of the outer case of the coaxial cable which would be connected to the casing components 3a and 3b by the spring fingers 12 and metal strip 11.

[0024] The casing components 3a and 3b are preferably comprised of metal although they may be metallised plastic for example provided there is a conducting path from the connecting elements metal strip 11 along the casing component 3a or 3b to the face plates 13a and 13b of the casing components 3a and 3b. The face plates 13a and 13b are metallised and when the cable connector 2 is connected to an item of electrical equipment 20 for example, the metallised face plates 13a and 13b are secured in electrical contact with the face plate assembly 21 of the electrical equipment 20 by securing screws 4a and 4b. This ensures that each coaxial cable 6 has its outer conductor electrically connected to the face plate 21 of the equipment 20 to which the cable

connector 2 is secured.

[0025] The connecting elements 10a and 10b are preferably comprised of a springy material such as beryllium copper alloy for example, to ensure positive contact between the casing components 3a and 3b and each cable termination socket 7. The spring fingers also allow for some movement of the termination socket 7 when the cable connector 2 is fitted to the piece of electrical equipment 20. Alternatively, the connecting elements 10a and 10b may be comprised of an electrically conducting strip adapted to connect each termination socket 7 to the casing components 3a and 3b. This electrically conducting strip may be comprised of a conductively loaded elastomer strip for example silver or copper. As a still further alternative, the connecting elements 10a and 10b may be formed integrally with the casing components 3a and 3b respectively. Various other methods of connecting the termination socket 7 to the casing components face plates 13a and 13b could also be used, for example a connection element 10a or 10b which extends to the face plates 13a and 13b.

[0026] As a further alternative, only one connecting element 10a may be used in the cable connector 2, the socket connector 8 requiring only a single longitudinal recess 9a and the cable connector 2 requiring only a single metallised bonding path on casing component 3a between the connecting element 10a and the face plate 13a.

[0027] Referring to Figure 3, the cable connector 2 is shown assembled with a cable loom 5 comprising a plurality of coaxial cables 6 entering the cable connector 2 and secured at the point of entry by a fixing element 14. Each coaxial cable 6 is terminated in an SCI socket 7 in which the outer square section conductor of the socket 7 is connected to the outer coaxial cable conductor, the termination socket 7 terminating in two non-coaxial sockets (not shown) corresponding to the inner and outer coaxial cable conductors. The SCI socket 7 maintains the coaxial electro-magnetic radiation suppression effect up to the non-coaxial sockets. The termination sockets 7 are fitted into the socket connector 8 which mates with a corresponding connector when the cable connector 2 is engaged in the face plate 21 of a piece of electrical equipment 20.

[0028] The longitudinal recess 9b in the socket connector 8 exposes the metallic outer conductor of each termination socket 7 such that it is connected to a metallic part of the casing component 3b by the connecting element 10b (not shown). This provides a conduction path between each termination socket 7 and the face plate 13b of the outer casing 3b, such that the outer conductor of each coaxial cable 6 is bonded to the face plate 21 which mates with the cable connector's face plate 13b. Similarly, a recess 9a on the other side of the socket connector 8 allows a further connecting element 10a to connect individual termination sockets 7 to the other casing component 3a such that each termination socket is bonded to the face plate 13a of that casing

component 3a.

[0029] The cable connector 2 of the invention provides improved bonding between multiple coaxial cables 6 and the ground 21 of equipment 20 to which the cable connector 2 is connected. The assembly 2 is easier and cheaper to manufacture than prior art arrangements and is also easier and faster to install saving on labour costs.

[0030] The connecting elements 10a and 10b are preferably secured to either the casing components 3a or 3b, or the socket connector 8 before installation of the coaxial cable 6. The metallic fingers 12 of the connecting elements 10a and 10b are pitched into the socket conductor recesses 9a and 9b to ensure intimate contact with the termination socket 7. The number of fingers 12 on each connection element 10a and 10b correspond to the number of termination sockets 7 to be fitted to the socket connector 8.

[0031] The casing components 3a and 3b are preferably secured together by screws (not shown) before and after assembly.

[0032] In use, coaxial cables 6 with termination sockets 7 are fitted into a socket connector 8. The socket connector 8 is then secured between two casing components 3a and 3b adapted to receive it and to connect the individual termination sockets 7 to each casing component 3a and 3b by internal connecting elements 10a and 10b. The casing components 3a and 3b are secured together to form the cable connector 2 which is then connected to the face plate 21 of an item of electrical equipment 20 using securing screws 4a and 4b to ensure positive electrical contact between the respective face plates 13a and 13b and 21.

[0033] The foregoing describes the invention including a preferred form thereof. Alterations and modifications as would be obvious to some one skilled in the art are intended to be incorporated within the scope hereof.

Claims

1. A cable connector comprising:

a linear socket connector for terminating a plurality of coaxial cables in respective sockets;
a casing component for housing said socket connector; and a connection element;
wherein said connection element is arranged to contact each coaxial cable to electrically connect each said cable to an outer surface of the casing component whereby to reduce electro-magnetic radiation emissions.

2. A cable connector as claimed in claim 1 wherein the connection element is connected to a metallised portion of said casing component, said portion extending to said outer surface.

3. A cable connector as claimed in claim 1 wherein the

connection element is formed integrally with a metallised portion of said casing component, said portion extending to said outer surface.

4. A cable connector comprising: 5
 - a socket connector for receiving a plurality of coaxial cable termination sockets;
 - a connection element;
 - a casing component adapted to receive a plurality of coaxial cables; 10
 - wherein said socket connector exposes at least a part of each termination socket when fitted, and wherein said connection element is arranged to electrically connect each said exposed part to an outer surface of the casing component. 15
5. A cable connector as claimed in claim 4 further comprising a plurality of coaxial cables each terminated in a termination socket. 20
6. A cable connector as claimed in claim 4 wherein the connection element is connected to a metallised portion of said casing component, said portion extending to said outer surface. 25
7. A cable connector as claimed in claim 4 wherein the connection element is formed integrally with a metallised portion of said casing component, said portion extending to said outer surface 30
8. A cable connector as claimed in claim 4, wherein said socket connector is an SCI connector and said termination sockets are SCI sockets. 35
9. A multiple coaxial cable connector as claimed in claim 8, wherein said SCI connector comprises a longitudinal recess which exposes the outer conductors of said SCI sockets when fitted. 40
10. A cable connector as claimed in claim 8, wherein said SCI connector comprises two longitudinal recesses on opposite sides of said SCI connector, each of which exposes the outer conductors of said SCI sockets when fitted. 45
11. A cable connector as claimed in claim 10, wherein said recesses are located at different sectional heights on said SCI connector. 50
12. A multiple coaxial cable connector as claimed in any preceding claim, wherein said connection element comprises a plurality of spring fingers for contact with each coaxial cable when fitted. 55
13. A method of connecting a plurality of coaxial cables using a cable connector comprising:

a socket connector for receiving a plurality of coaxial cable termination sockets;
 a connection element;
 a casing component adapted to receive a plurality of coaxial cables;
 wherein said socket connector is adapted to expose at least a part of each termination socket when fitted, and wherein said connection element is arranged to electrically connect each said exposed termination socket to an outer surface of the casing component. the method comprising the steps of:
 fitting a plurality of coaxial cables each terminated in a termination socket into said socket connector;
 securing said casing component to said socket connector such that said connecting element bonds each termination socket to said outer surface;
 securing said cable connector to a receiving element.

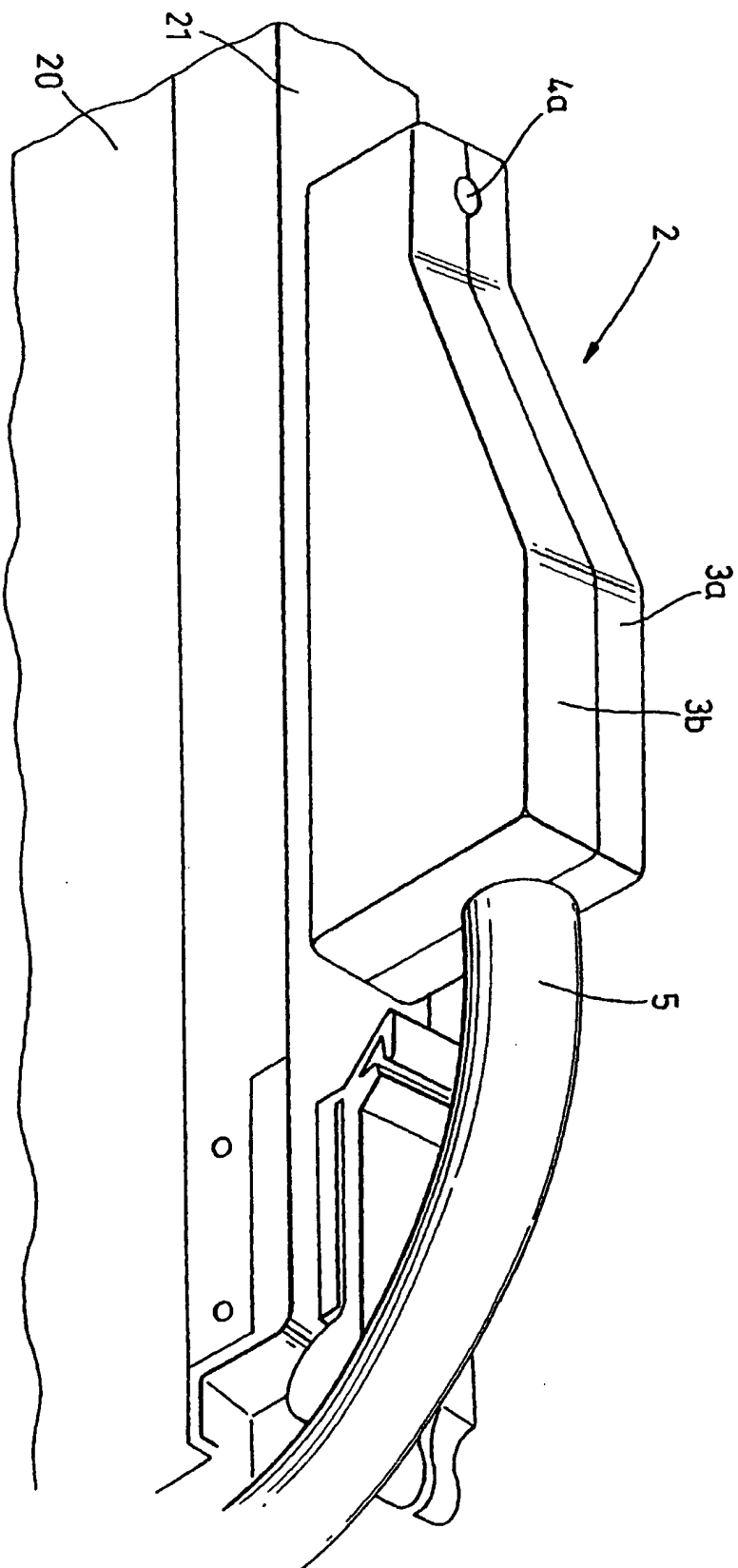
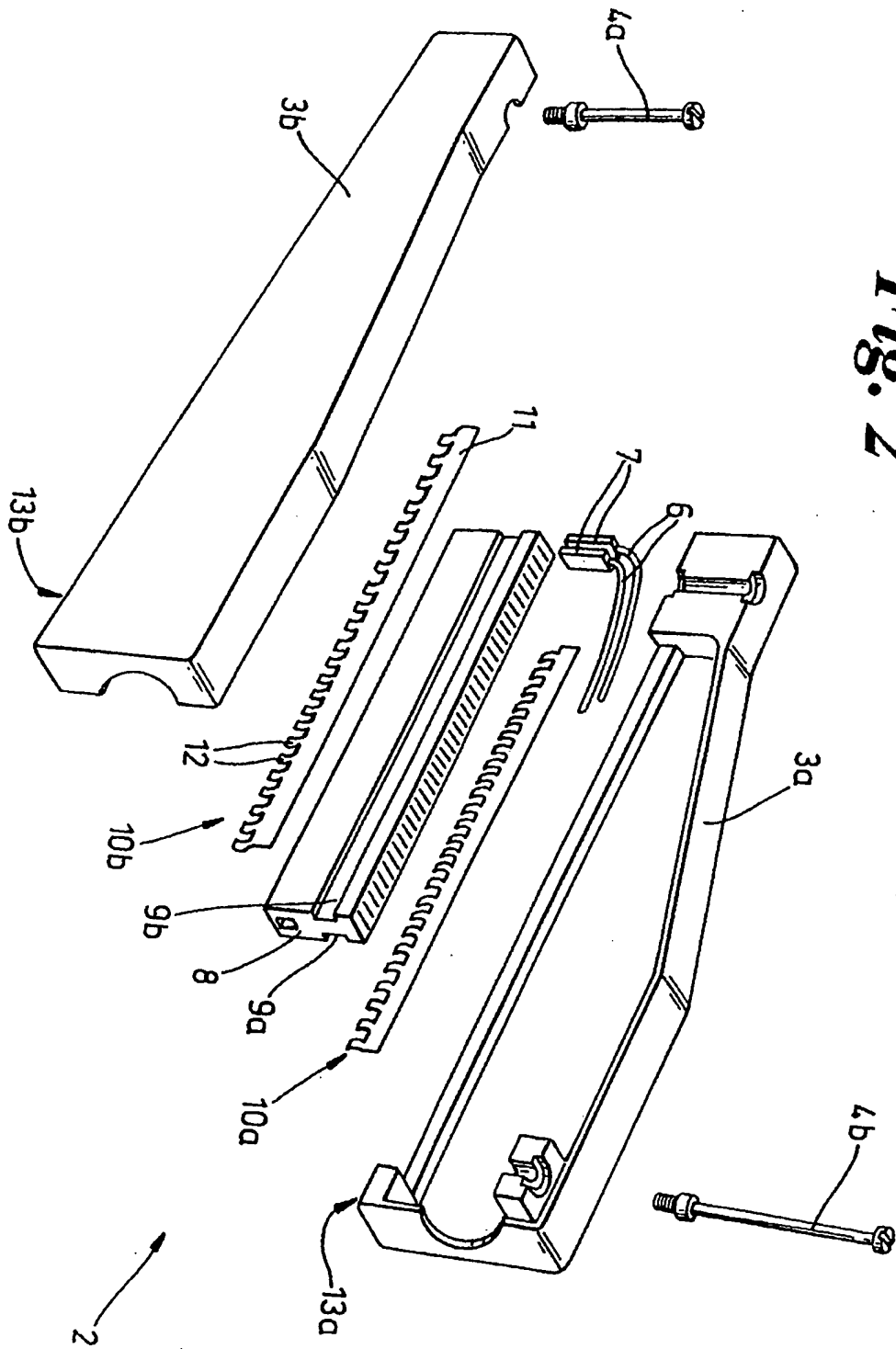


Fig. 1

Fig. 2



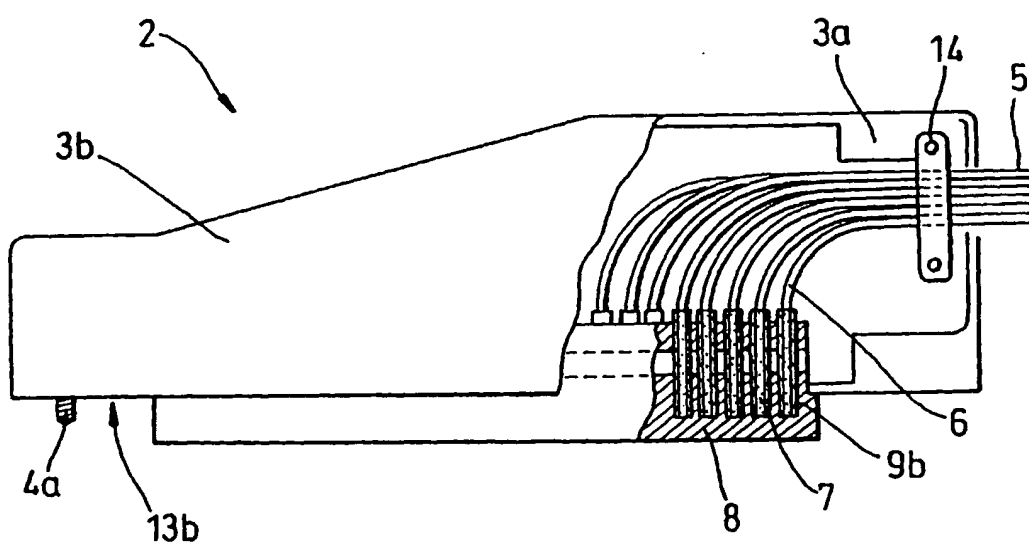


Fig. 3



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 0507

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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10 August 1999	Examiner Kohler, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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